L J U B L J A N I C A C O N N E C T S

LIFE10 NAT/SI/142

RECONSTRUCTION OF THE FISH PASS AT FUŽINE WEIR

Action: C2

Author of the report: Klaudija Sapač

TABLE OF CONTENTS

INTRODUCTION

The fish pass at the Fužine weir was restored in cooperation with and (co)funding of Papirnica Vevče, i.e. the owner of the structure. In autumn 2013, the fish pass at the Fužine weir collapsed following high flows as a consequence of prolonged rainfall; therefore, the originally proposed measures provided for in the Grant Agreement were no longer appropriate.

Thus, we had to explore and consider new ways to reach the stated objectives. An agreement was reached with the company Papirnica Vevče, i.e. the owner of the weir at the hydropower plant and thus also the fish pass, and other project beneficiaries (Annex 1) stating that Papirnica Vevče would finance the restoration of the fish pass, while, based on their consent (Annex 2), we, the project partners, would install a debris deflector deflecting the debris around the exit of the fish pass. The installed deflector does not only improve the operation of the fish pass but of the weir as a whole, because the debris no longer accumulates behind the grill of the weir.

The fish pass was restored in 2015.

Problems encountered

The restoration works at the fish pass at Fužine were scheduled to take place after the completion of the works under action C1, i.e. in the beginning of 2014. Unfortunately, in November 2013, the fish pass collapsed due to high flows, i.e. water forces acting on the fish pass walls (Figure 1, right and Figure 2). Field visits showed that the original restoration plan was not suitable, i.e. that the implementation of the originally planned works would not help us reach the project objectives of restoring the functionality of the fish pass at the Fužine weir. New design concepts and design of restoration measures had to be produced, which led to a delay in the start of works. A more careful planning was required, because the structure was more damaged than originally thought. This became apparent already during the collapse of the structure. However, it turned out that the costs of restoring the entire fish pass were considerably lower than if the fish pass had been restored only partially. Namely, the reconstruction of the entire structure is less complex and thus also cheaper.

Figure 1: The fish pass at the Fužine weir prior to the restoration and its collapse (left) and after the collapse in autumn 2013 (right).

THE REPORT ON THE RECONSTRUCTION WORKS

The associated beneficiary, Purgator inženiring d.o.o., was in charge of the selection of subcontractors preparing the design documentation and designs for restoration and supervision of the proper implementation of the measures, i.e. in a way to reach the pursued objectives. In the first stage of action C2, i.e. in relation to the restoration of the Fužine fish pass, many field visits were undertaken, various measurements were made, and meetings with various stakeholders were held (with the owner of the structure, fishermen, etc.).

Prior to the restoration works, the following consents were required (Action A2 report):

- The water consent issued by the Slovenian Environment Agency for the reconstruction of the fish pass at the Fužine weir (action C2) of 17 March 2015. The consent was required because of the works that could affect the water regime and status of water. The design conditions issued by the Slovenian Environment Agency had to be met. The design documentation for reconstructing the fish pass at the Fužine weir had to demonstrate that the interventions would not deteriorate the conditions of waters and water regime.
- The consent by Papirnica Vevče for the installation of deflectors at the entrance grill to the fish pass at the Fužine weir (action C2) of 3 February 2016. The consent was required because Papirnica Vevče is the owner of the structure.

The design documentation was prepared by DK-proTIM d.o.o. in October 2014 (Annex 3). The restoration works at the fish pass were carried out by ELQ d.o.o. The works started in January 2015 and were completed in April 2015.

The reconstruction of the fish pass at Fužine restored the longitudinal connectivity of the Ljubljanica River between its mouth into the Sava River and the sluice gate at Ambrožev trg. Following the restoration of the sluice gates at Ambrožev trg, the connectivity was improved all the way to the upstream parts of the Ljubljanica River.

First the collapsed parts of the fish pass (Figure 1 right, figure) were removed, then moss and other vegetation was removed from the walls still in place (see Figure 3).

Figure 2: The fish pass at the Fužine weir after its collapse due to high flows

Figure 3: Start of works on fish pass at Fužine weir

Even prior to the collapse of the fish pass (in October 2013), terrestrial laser scanning was conducted by the company Tadej Srdinšek s.p. During action C2, the associated beneficiary Purgator inženiring, sought the professional help of external services (e.g. Audacia) in the case when the company lacked experience or when other expert consultation was necessary.

Figure 4: The installation of the cameras following the completion of the works for monitoring the operation of the fish pass

Prior to the restoration, the non-operation of the fish pass was not only the result of damages and lack of maintenance, but also due to the presence of the grill preventing the debris from entering the fish pass. In fact, the grill was counterproductive – the debris got stuck between the bars and prevented the fish that successfully swam through the fish pass from exiting the fish pass to the river's upstream part (above the weir). Thus, under this action, the grill was replaced by a more efficient protective element preventing the ingress of debris into the fish pass, while also deflecting the floating debris to prevent the clogging of the exit of the fish pass (Figure 4).

Figure 5: The build-up of debris behind the grill prior to the restoration of the fish pass

As mentioned earlier, the implementation of this action had to be changed due to the problems encountered in action C2. Thus, the European Commission's approval for modification was sought in a request of 28 July 2014. The requested modifications for action C2 were the following (Table 1):

Table 1: Originally foreseen and approved change for action C2

Originally foreseen	Approved change
Equipping the inflow with mobile inflow that could adapt to the water levels	Adding the improvements that will allow fish migration at the same time as building the new Fužine fish pass (as part of the new structure)
Lowering the outflow sections by inserting sheet piles and quarry stones embankment in the channel	Reconstruction of fish pass on Ambrožev trg by extending the inflow and lowering the gradient of the fish pass.
Regulating the gradient of the existing fish passes by extending their length and culvert excavation through the river bank	

The requested modification was approved by European Commission, by Email dated 22 August 2014 by Ms Muriel Drukman (non-substantial modification).

As an activity undertaken outside this project, we should stress the great readiness of Papirnica Vevče to take part in the restoration of the fish pass (its owner). We identified no other, i.e. outside-LIFE, activities during the implementation of the project.

Despite reaching the objectives pursued in action C2, regular maintenance of the fish pass will be required for its long-term functionality: removal of moss and other vegetation, impregnation of wooden boards making up the walls of the fish pass, etc.

The success of the restoration measures is monitored using cameras that were developed by the coordinating beneficiary (its operation is presented under action E2). The originally proposed method involving VIE tagging did not prove successful (action E2 report).

Figure 6: Cameras at the exit of the fish pass at the Fužine weir

CONCLUSION

The reconstruction of the fish pass at Fužine restored the longitudinal connectivity of the Ljubljanica River between its mouth into the Sava River and the sluice gate at Ambrožev trg. Following the restoration of the sluice gates at Ambrožev trg, the connectivity was improved all the way to the upstream parts of the Ljubljanica River.

ANNEXES

Annex 1: Minutes of the meeting with Papirnica Vevče

Annex 2: Consent of Papirnica Vevče for the installation of the deflector

Annex 3: The technical design for reconstruction of fish pass at Fužine weir

Annex 1: Minutes of the meeting with Papirnica Vevče

Minutes of the meeting of LIFE10 NAT/SI/142 project partners – UL FGG, Purgator d.o.o., and B&B Papirnica Vevče
Date of Meeting: 19 October 2015
Meeting Location: Papirniški trg 16, Ljubljana

Attendees: Boštjan Smrekar (Papirnica Vevče), Matej Stegel, Metod Dolinšek (both Purgator d.o.o.), Mitja Brilly, Andrej Vidmar, Anja Vihar (all UL FGG)

Ad1) The objective of the meeting was to reach an agreement regarding further improvements of the fish pass at Fužine Castle, and to clear the misunderstanding due to an incorrect presentation of the renovation works undertaken at the fish pass to date.

Ad2) Mr Vidmar explained that one of the "Ljubljanica Connects" project goals is to improve river connectivity, which includes the reconstruction of the fish pass at Fužine Castle. To improve the operation of the fish pass, he proposed that an element preventing the inflow and deposition of debris is installed at the inlet.

Ad3) Prof Brilly explained there was a communication issue resulting from an incorrect presentation of the fish pass restoration to date, which was given as part of the City Municipality of Ljubljana's (MOL) round table of 19 June 2015. The destroyed fish pass was fully repaired and brought back into operation, which was financed by Papirnica Vevče. This was confirmed by both Mr Stegel and Mr Dolinšek. Prof Brilly explained that within the "Ljubljanica Connects" project, there was a plan to improve the fish pass even further – by installing a deflector and filling the cracks in the pass. Furthermore, Prof Brilly explained that for installing the deflector a consent of Papirnica Vevče is required.

Ad4) Mr Smrekar explained that Papirnica Vevče owned the structure, i.e. the weir, and thus also the fish pass; furthermore, Papirnica Vevče holds a concession for exploiting hydroelectric power. To obtain the consent, Papirnica Vevče would require an application with a detailed description of work and a sketch of the deflector, which would then be subject to approval. It was suggested that the consent would be given provided that Papirnica Vevče would bear none of the installation costs, that the power plant's operation would not be limited (neither during the installation works nor after), and that the power plant's capacity would not decrease due to the installation. It was agreed that the required consent from owner will be obtained by the project partner, Purgator d.o.o., who has the responsibility to implement the activity linked to the Fužine fish pass improvements, before the installation.

Ad5) Prof. Brilly concluded that the deflector would not only improve the operation of the fish pass, but of the weir as a whole, because debris would no longer get caught behind the net.

Minutes taker: Anja Vihar, UL FGG

The Minutes from the meeting on 19 October 2015 were approved by the attendees:

- Prof. Mitja Brilly, PhD
- Andrej Vidmar, MSc
- Boštjan Smrekar
- Matej Stegel
- Metod Dolinšek

Annex 2: Consent of Papirnica Vevče for the installation of the deflector

PAPIRNICA VEVČE
LABELS AND FLEXPACK

ELQ d.o.o.

Polje cesta XXII/7

1260 Ljubljana Polje

Ljubljana, 03.02.2016

Na podlagi vloge za izdajo soglasja z dne 7.1.2016 in na podlagi vodnega soglasja k posegu s priloženimi skicami ter na podlagi Zakona o vodah (ZV-1 Ur.l.RS 67/02) izdajamo

SOGLASJE

za namestitev odbojnikov (deflektorjev) plavja na treh vstopnih rešetkah v ribjo stezo na jezu HE Fužine. Celotna izvedba je financirana iz projekta »Ljubljanica povezuje NATURA 2000 LIFE10NAT/SI/142, Obnovitev koridorja Ljubljanice in izboljšanje rečnega režima C2 – ribja steza – grad Fužine« pod naslednjimi pogoji:

a) Papirnica Vevče v nobenem primeru ne nosi nobenih stroškov v zvezi z izvedbo,

b) Delovanje elektrarne niti med posegom niti po njem ne sme biti omejeno.

c) Zmogljivost elektrarne zaradi tega posega ne bo manjša.

Investitir je dolžan upoštevati vse predpisane varnostne ukrepe. O pričetku del mora investitor pisno obvestiti Papirnico Vevče 14 dni pred začetkom del.

Pripravil: B. Smrekar

Papirnica Vevče d.o.o.

Marko Jagodič, direktor

Mojca Žužek, prokuristka

Annex 3: The technical design for reconstruction of fish pass at Fužine weir

REPUBLIKA SLOVENIJA
MINISTRSTVO ZA KMETIJSTVO IN OKOLJE

Univerza v Ljubljani
Fakulteta za gradbeništvo in geodezijo

PURGATOR

GEATEH
Načrtovanje in izvajanje, d.o.o.

LJUBLJANICA POVEZUJE LIFE10NAT/SI/142

Obnovitev koridorja Ljubljanice in izboljšanje rečnega vodnega režima

C2 - RIBJA STEZA - GRAD FUŽINE

VZDRŽEVANJE OBJEKTA VODNOGOSPODARSKE UREDITVE

PZI

DK-proTIM

št.	načrt	št. načrta
0	VODILNA MAPA	06-14-00
3	NAČRT GRADBENIH KONSTRUKCIJ IN DRUGI GRADBENI NAČRTI	06-14-03

Št. projekta:
06-14

Številka mape:
1

Maribor, februar 2015

DK-PROTIM d.o.o.
Spodnjevaška pot 36
2000 Maribor
Slovenija

0 – VODILNA MAPA

Investitor:

REPUBLIKA SLOVENIJA
MINISTRSTVO ZA KMETIJSTVO IN OKOLJE

Univerza v Ljubljani
Fakulteta za gradbeništvo in geodezijo

PURGATOR

GEATEH
Načrtovanje in izvajanje, d.o.o.

Objekt: ***LJUBLJANICA POVEZUJE LIFE10NAT/SI/142***
Obnovitev koridorja Ljubljanice in izboljšanje rečnega vodnega režima

C2 – RIBJA STEZA – GRAD FUŽINE

Vrsta projektne dokumentacije: ***PZI***

Za gradnjo: ***VZDRŽEVANJE OBJEKTA VODNOGOSPODARSKE UREDITVE***

Projektant:

DK-PROTIM d.o.o.
Spodnjevaška pot 36
2000 Maribor

Odgovorna oseba projektanta:

mag. Darko Kočar, univ. dipl. inž. grad.

.....
(podpis)

.....
(žig)

Odgovorni vodja projekta:

mag. Darko Kočar, univ. dipl. inž. grad.

.....
(osebni žig, podpis)

Številka projekta: ***06-14***

Izvod št.: ***1 2 3 4 5 6***

Kraj in datum izdelave projekta: ***Maribor, februar 2015***

0.2 KAZALO VSEBINE VODILNE MAPE št. 06-14-00

0.3 KAZALO VSEBINE PROJEKTA št. 06-14

0.4 SPLOŠNI PODATKI O OBJEKTU IN SOGLASJIH

Zahtevnost objekta:	**nezahteven objekt**	
Klasifikacija celotnega objekta:	2 GRADBENI INŽENIRSKI OBJEKTI 21 Objekti transportne infrastrukture 215 Pristanišča, plovne poti, pregrade in jezovi ter drugi vodni objekti 2152 Pregrade in jezovi **21520 ribja steza**	
Klasifikacija posameznih delov objekta:	*Delež v skupni uporabni površini objekta*	*Šifra podrazreda*
	100%	CCSI 21520
Druge klasifikacije		
Navedba prostorskega akta:	• **Prostorske sestavine planskih aktov občine:** • **Prostorski ureditveni pogoji:** • **Prostorski izvedbeni načrt:**	
Lokacija:	Ljubljana, **k.o. Slape**	
Seznam zemljišč z nameravano gradnjo:	**Parcela št.** 1536/1, **k.o. Slape**	
Seznam zemljišč preko katerih potekajo priključki na gospodarsko javno infrastrukturo:	/	
Seznam zemljišč preko katerih potoka priključek na javno cesto:	**Parcela št.** 1536/1, 1093/2, 1088/2, vse **k.o. Slape**	
Navedba soglasij in soglasij za priključitev:	*Soglasja v območju varovalnih pasov*	
	Soglasja v varovanih območjih	**REPUBLIKA SLOVENIJA - MOP, AGENCIJA REPUBLIKE SLOVENIJE ZA OKOLJE,** Urad za upravljanje z vodami, Sektor za porečje reke Save, Oddelek območja Srednje Save, Einspillerjeva 6, 1000 Ljubljana, št.: z dne
	Soglasja za priključitev	**Kanalizacija in Vodovod:** **Električno omrežje:** **Telekomunikacijsko omrežje:**

Način zagotovitve minimalne komunalne oskrbe:	*Oskrba s pitno vodo*	/
	Oskrba z elektriko	/
	Odvajanje odpadnih voda	/
	Dostop do javne ceste	/
ocenjena vrednost objekta	**45.939,08 €**	
odmiki od sosednjih zemljišč	**– odmiki so obstoječi** **– vzdrževalna dela na ribji stezi grad Fužine C2**	

0.5 PODATKI O IZDELOVALCIH PROJEKTA

"0" Vodilna mapa:	Odgovorni vodja projekta:	DK-PROTIM d.o.o., Spodnjevaška pot 36, 2000 Maribor, info@dk-protim.si, tel.: 041 677 987 mag. Darko Kočar, univ. dipl. inž. grad., IZS G-0567
	Sodelavci:	Peter Grginič, univ. dipl. inž. grad.

"3" Načrt gradbenih konstrukcij in drugi gradbeni načrti:	Projektant:	DK-PROTIM d.o.o., Spodnjevaška pot 36, 2000 Maribor, info@dk-protim.si, tel.: 041 677 987
	Odgovorni projektant:	mag. Darko Kočar, univ. dipl. inž. grad., IZS G-0567
Sodelavci:		Peter Grginič, univ. dipl. inž. grad.

3 – NAČRT GRADBENIH KONSTRUKCIJ IN DRUGI GRADBENI NAČRTI

Investitor:

REPUBLIKA SLOVENIJA
MINISTRSTVO ZA KMETIJSTVO IN OKOLJE

Univerza v Ljubljani
Fakulteta za gradbeništvo in geodezijo

PURGATOR

GEATEH
Načrtovanje in izvajanje, d.o.o.

Objekt: ***LJUBLJANICA POVEZUJE LIFE10NAT/SI/142***
Obnovitev koridorja Ljubljanice in izboljšanje rečnega vodnega režima

C2 – RIBJA STEZA – GRAD FUŽINE

Vrsta projektne dokumentacije: ***PZI***

Za gradnjo: ***VZDRŽEVANJE OBJEKTA VODNOGOSPODARSKE UREDITVE***

Projektant:

DK-PROTIM d.o.o.
Spodnjevaška pot 36
2000 Maribor

Odgovorna oseba projektanta:

mag. Darko Kočar, univ. dipl. inž. grad.

.....
(podpis)

.....
(žig)

Odgovorni projektant:

mag. Darko Kočar, univ. dipl. inž. grad.

.....
(osebni žig, podpis)

Odgovorni vodja projekta:

mag. Darko Kočar, univ. dipl. inž. grad.

.....
(osebni žig, podpis)

Številka načrta: ***06-14-03***

Izvod št.: ***1 2 3 4 5 6***

Številka projekta: ***06-14***

Kraj in datum izdelave projekta: ***Maribor, februar 2015***

3.2 KAZALO VSEBINE NAČRTA št.: 06-14-03

VSEBINA NAČRTA
»NAČRT GRADBENIH KONSTRUKCIJ IN DRUGI GRADBENI NAČRTI«

3.4 TEHNIČNO POROČILO

3.4. TEHNIČNO POROČILO

Kazalo:

3.4.1. SPLOŠNO

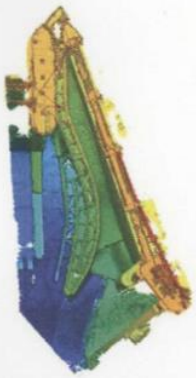
Projektna dokumentacija prikazuje predvidena sanacijsko-ureditvena dela na ribji stezi pri elektrarni ob gradu Fužine, kateri stoji ob Ljubljanici na jugovzhodnem delu Ljubljane, na naslovu Pot na Fužine 2, katera se bodo izvedla v sklopu projekta LIFE+ - Obnovitev koridorja Ljubljanice in izboljšanje rečnega vodnega režima – Ljubljanica povezuje (Ljubljanica connects).

Ribja steza, ki je sestavni del hidroelektrarne Fužine, se nahaja za obrežnim opornikom jezu na levem bregu struge. Namenjena je prehodu rib saj s tem zagotavlja povezanost vodnega habitata, ki bi ga jez sicer razdelil. Sestavljena je iz armiranobetonskega kanala s stenami in z bazeni/tolmuni. Na vtoku v ribjo stezo so nameščene tudi rešetke iz jeklenih palic, ki preprečujejo vnos plavja in s tem morebitno zamašitev ribje steze.

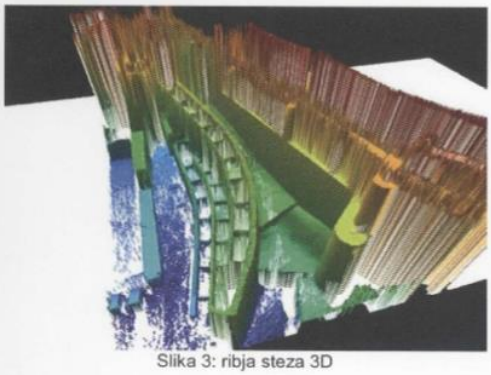
Slika 1: prikaz območja ureditve - ribja steza ob elektrarni na Ljubljanici pri gradu Fužine

Ribja steza, kot sestavni del hidroelektrarne, predstavlja objekt vodne infrastrukture, ki je v lasti Republike Slovenije in s katerim, v imenu lastnika, preko Agencije Republike Slovenije za okolje, Urada za upravljanje z vodami, Oddelka za povodje Srednje Save, upravlja Ministrstvo za okolje in prostor.

Kot je razvidno iz slike 1 bi se vsa predvidena dela izvajala na parceli št. 1536/1 – k.o. Slape – vodotok v lasti RS, pri čemer bi bil dostop urejen preko iste parcele – pot v lasti Papirnica Vevče d.o.o., Ljubljana.



Slika 1: ribja steza 2D



Slika 3: ribja steza 3D

V jeseni 2013 so neurja in velike količine vode v Ljubljanici, poškodovale ribjo stezo. Del ribje steze se je zaradi sile vode zrušil. Z lastniki objekta - podjetjem B & B Vevče d.o.o. in drugimi upravičenci, smo dosegli skupno odločitev rekonstruirati del ribje steze katera je trenutno uničena, kot tudi sanirati preostali še stoječi del ribje steze, tako da bi bila ribja steza ponovno v celoti uporabna in funkcionalna.

3.4.2. PROBLEMATIKA

Pri zagotavljanju funkcionalnosti ribje steze, katere glavni namen je zveznost vodnega habitata na območju jezu, se v obstoječem stanju pojavljata dve glavni težavi, in sicer:

1) Zaradi zaustavljanja in nabiranja plavja na vertikalnih palicah rešetk na vtoku v stezo ribe, ki so sicer že zaplavale v ribjo stezo, ne morejo prehajati iz nje, saj plavje zapira vtočno odprtino in s tem onemogoča, da bi ribe nemoteno zapustile stezo in zaplavale v zgornjo vodo. Doseženi učinek rešetk je tako v obstoječem stanju ravno nasproten od želenega, saj je njihov glavni namen prav preprečevanje vtoka plavja v ribjo stezo ter posledičnega mašenja le-te.

Slika 4: vzdrževalna dela na ribji stezi pred neurjem

2) Poškodovana ribja steza po neurju leta 2013 je delno porušena in ni v funkciji. Dotrajan objekt je tako nefunkcionalen in ni v uporabi. Na dnu steze se nahajajo pragovi (stopnje), ki ribam onemogoča normalno prehajanje v strugo gorvodno od zapornice, vendar so dotrajani delno porušeni in z nanosom materiala tudi delno zamašeni z zmanjšano pretočnostjo in prepusnostjo.

Slika 5: porušitev sten ribje steze po neurju

3.4.3. PREDLOG REŠITVE IN OPIS PREDVIDENIH DEL

Dela, predvidena za ureditev ribje steze, bi se izvedla v dveh fazah. V okviru prve faze bi se tako uredil porušeni del steze, medtem ko je v drugi fazi predvideno »čiščenje mahgu in tolmunov, visokotlačno čiščenje, krpanje malih poškodb na drugih delih steze in zaščito/barvanje« ter ureditev notranjosti ribje steze.

3.4.3.1. UREDITEV ZUNANJOSTI IN NOTRANJOSTI RIBJE STEZE

Prvotno bi se odstranil porušeni del zidu ter pregrad in se izvedel novi zid z novimi prekat, nato bi se zunanje obstoječe neporušene stene z obeh strani visokotlačno očistilo in odstranilo mah. Tolmuni bi se izpraznili nakopičenega materiala in se prav tako očistile – odstranitev mahu. Stene in krona zidu bi se posanirala z betonom ter zakrpale bi se morebitne luknje na dnu ribje steze kot tudi na stenah. Sledil bi nanos zaščitnega dvokomponentnega premaza Sikagard-63 N, kateri ne vsebuje topil in je abrazijsko odporen univerzalen premaz primeren za normalno pa do visoko kemijsko agresivno okolje in je namenjen uporabi na betonu, cementnih maltah, epoxi maltah kot tudi jeklu in aluminiju. Deluje kot protikorozijska zaščita in smola za laminacijo z zmožnostjo premoščanja razpok pri zaščiti betonskih površin. S tem bi dosegli vodotesnost in s tem podaljšanje življenjske dobe ribje steze.

3.4.4. ZAKLJUČEK

Z izvedbo predlaganih ukrepov, ki ne zahtevajo obsežnih sanacijskih del in tudi ne predstavljajo bistvenega posega v obstoječe stanje ribje steze, bi se funkcionalnost steze znatno izboljšala.

Vsi opisani ukrepi so načrtovani tako, da so elementi ureditev rekonstruirani in obnovljeni kar znatno podaljša življenjsko dobo ribje steze ter zmanjša stroške rednih kontrolnih pregledov in dragih vzdrževanj.

C2 REKONSTRUKCIJA IN VZDRŽEVALNA DELA NA RIBJI STEZI GRAD FUŽINE

POPIS DEL

1.0	**PRIPRAVLJALNA DELA**			
1.01.	NAJEM AVTODVIGALA dovoz / odvoz dvigala in podložnih plošč z Unimogom rezalec vej...			
	1,00	kpl	780,00 €	780,00 €
1.02.	NAJEM USTREZNEGA DVIGALA 110,50€/h (min 4h/dan)			
	12,00	ur	110,50 €	1.326,00 €
1.03.	ODSTRANITEV VEJ ZARADI MANIPULACIJE Z DVIGALOM odstranjevanje in odvoz na deponijo			
	2,50	m^3	169,00 €	422,50 €
1.04.	ODSTRANITEV RUŠENEGA MATERIALA z razrezom na ustrezne kose, priprava za transport pomoč pri nakladanju			
	60,00	ur	23,40 €	1.404,00 €
1.05.	ODVOZ RUŠENEGA MATERIALA na deponijo s plačilom taks			
	5,00	m^3	234,00 €	1.170,00 €
1.06.	ODBIJANJE IN PORAVNAVA BETONSKIH ZIDOV KORITA na mestih spoja z novo steno korita			
	20,00	ur	23,40 €	468,00 €
1.07.	ČIŠČENJE IN ODSTRANJEVANJA MAHA (dela predvidena na preostalih, neporušenih stenah)			
	1,00	kpl	980,00 €	980,00 €
1.08.	POSTAVITEV TABLE			
	1,00	kpl	250,00 €	250,00 €
	SKUPAJ 1.0.			**6.800,50 €**
2.0.	**OBRTNIŠKA DELA**			
2.01.	IZDELAVA IN MONTAŽA KOVINSKIH STEBROV nosilci lesa kpl z izmerami in pripravo dokumentacije montaža na temelj in vpetje v steno steze			
	7,00	kos	1.170,00 €	8.190,00 €
2.02.	IZDELAVA IN MONTAŽA SPOJNIH ELEMENOV med betonskim in kovinskim delom korita			

	2,00 kos		884,00 €	1.768,00 €
2.03.	POLNILA STEN KORITA iz hrastovih plohov debeline 5cm, utorjeno vgrajeno v posamezne prekate dvoslojno in tesnjeno			
	4,10	m^3	3.250,00 €	13.325,00 €
2.04.	TESNJENE STIKOV			
	25,00	m^1	29,00 €	725,00 €
2.05.	SANACIJAOBSTOJEČIH ZIDOV RIBJE STEZE izpiranje, čiščenje, odstranjevanje poškodovanih delov nanos betonske zmesi na poškodovana mesta krone (sanacija celotne krone in sten, na določenih mestih)			
	105,00	m^2	32,00 €	3.360,00 €
	SKUPAJ 2.0			**27.368,00 €**
3.0	**ZAVAROVALNA DELA**			
3.01.	STROKOVNA POMOČ IN NADZOR IZVAJALCU glede na specifikacijo lokacije			
	1,00	kpl	1.040,00 €	1.040,00 €
3.02.	NEPREDVIDENA DELA			
	5,00	%	2.187,58 €	2.187,58 €
	SKUPAJ 3.0			**3.227,58 €**
4.0	**ZAKLJUČNA DELA**			
4.01.	POPRAVILO ZELENICE PO DELIH v kolikor bo prišlo do poškodb zarad postavitev vozil			
	1,00	kpl	494,00 €	494,00 €
4.02.	2-KOMPONENTNI EPOXI ZAŠČITNI PREMAZ (v višini do 1m po celotni ribji stezi - Sikagard®-63 N)			
	120,00	m^2	45,00 €	5.400,00 €
	SKUPAJ 4.0			**5.894,00 €**
5.0.	**PREOSTALA DELA**			
5.01.	PRIPRAVA VARNOSTNEGA NAČRTA			
	1,00	kpl	300,00 €	300,00 €
5.02.	PID			
	1,00	kpl	1.950,00 €	1.950,00 €
5.03.	GEODETSKI POSNETEK IZVEDENIH DEL			
	1,00	kpl	399,00 €	399,00 €
	SKUPAJ 5.0			**2.649,00 €**

REKAPITULACIJA IZVEDBA DEL:	
1.0. PRIPRAVLJALNA DELA	6.800,50 €
2.0. ZEMELJSKA DELA	27.368,00 €
3.0. ZAVAROVALNA DELA	3.227,58 €
4.0. ZAKLJUČNA DELA	5.894,00 €
5.0. PREOSTALA DELA	2.649,00 €
SKUPAJ:	45.939,08 €
DDV 22%	10.106,60 €
SKUPAJ Z DDV	56.045,67 €

3.5 RISBE

RISBE

3.5.1	PREGLEDNA SITUACIJA	M 1:1000
3.5.2	OBMOČJE UREJANJA	M 1:100


GRAD FUŽINE
PURGATOR
GEATEH
PREGLEDNA SITUACIJA
FEBRUAR 2015


Vtok v ribjo stezo
Tok vode
Iztok iz ribje steze
LEGENDA
PARCELNE MEJE
PURGATOR
GEATEH
DK-ProTra d.o.o.
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FAX: +386 59 123 303
info@dk-protra.si : www.dk-protra.si
LJUBLJANICA POVEZUJE LIFE10NAT/SI/143
Obnovitev koridorja Ljubljanice in izboljšanje rečnega vodnega režima
C2 – RIBJA STEZA – GRAD FUŽINE
PZI
06-14
1:100
06-14-03
FEBRUAR 2015
5.5.2
5.0 NAČRT GRADBENIH KONSTRUKCIJ IN DRUGI GRADBENI NAČRTI
OBMOČJE UREJANJA